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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA-2019-0851; Special Conditions No. 25-763-SC]

Special Conditions: VT DRB Aviation Consultants, Airbus Model A330-300 Airplanes; Dynamic Test Requirements for Single-Occupant, Oblique (Side-Facing) Seats With or Without Airbag Devices or 3-Point Restraints.

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions; request for comments.

SUMMARY: These special conditions are issued for the Airbus Model A330-300 airplane. This airplane, as modified by VT DRB Aviation Consultants (VT DRB), will have novel or unusual design features when compared to the state of technology envisioned in the airworthiness standards for transport-category airplanes. This design feature is single-occupant, oblique (side-facing) seats with airbag devices or 3-point restraints. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

DATES: This action is effective on VT DRB on [INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER]. Send comments on or before [INSERT DATE 45 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: Send comments identified by Docket No. FAA-2019-0851 using any of the following methods:

- *Federal eRegulations Portal:* Go to <http://www.regulations.gov/> and follow the online instructions for sending your comments electronically.
- *Mail:* Send comments to Docket Operations, M-30, U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE., Room W12-140, West Building Ground Floor, Washington, DC, 20590-0001.
- *Hand Delivery or Courier:* Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.
- *Fax:* Fax comments to Docket Operations at 202-493-2251.

Privacy: The FAA will post all comments it receives, without change, to <http://www.regulations.gov/>, including any personal information the commenter provides. Using the search function of the docket Web site, anyone can find and read the electronic form of all comments received into any FAA docket, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). DOT's complete Privacy Act Statement can be found in the *Federal Register* published on April 11, 2000 (65 FR 19477-19478).

Docket: Background documents or comments received may be read at <http://www.regulations.gov/> at any time. Follow the online instructions for accessing the docket or go to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: Alan Sinclair, Airframe and Cabin Safety Section, AIR-675, Transport Standards Branch, Policy and Innovation Division, Aircraft Certification Service, Federal Aviation Administration, 2200 South 216th Street, Des Moines, Washington, 98198; telephone and fax 206-231-3215; e-mail alan.sinclair@faa.gov.

SUPPLEMENTARY INFORMATION:

The FAA has determined that notice of, and opportunity for prior public comment on, these special conditions is impracticable because these procedures would significantly delay issuance of the design approval and thus delivery of the affected airplanes.

In addition, the substance of these special conditions has been published in the *Federal Register* for public comment in several prior instances with no substantive comments received. Therefore, the FAA has determined that prior public notice and comment are unnecessary, and finds that, for the same reason, good cause exists for adopting these special conditions upon publication in the *Federal Register*.

Comments Invited

The FAA invites interested people to take part in this rulemaking by sending written comments, data, or views. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data.

The FAA will consider all comments received by the closing date for comments. The FAA may change these special conditions based on the comments received.

Background

On October 12, 2018, VT DRB applied for a supplemental type certificate for oblique (side-facing) single-occupant seats equipped with airbag devices or 3-point restraints in Airbus Model A330-300 airplanes. The Airbus Model A330-300 airplane is a twin-engine, transport-category airplane with a maximum takeoff weight of 533,518 pounds and seating for 297 passengers.

Type Certification Basis

Under the provisions of title 14, Code of Federal Regulations (14 CFR) 21.101, VT DRB must show that the Airbus Model A330-300 airplane, as changed, continues to meet the applicable provisions of the regulations listed in Type Certificate No. A46NM or the applicable regulations in effect on the date of application for the change, except for earlier amendments as agreed upon by the FAA.

If the Administrator finds that the applicable airworthiness regulations (e.g., 14 CFR part 25) do not contain adequate or appropriate safety standards for the Airbus Model A330-300 airplane because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions are initially applicable to the model for which they are issued. Should the applicant apply for a supplemental type certificate to modify any other model included on the same type certificate to incorporate the same novel or unusual design feature, these special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and special conditions, the Airbus Model A330-300 airplane must comply with the fuel-vent and exhaust-emission

requirements of 14 CFR part 34, and the noise-certification requirements of 14 CFR part 36.

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38, and they become part of the type certification basis under § 21.101.

Novel or Unusual Design Features

The Airbus Model A330-300 airplane will incorporate the following novel or unusual design features:

Single-occupant, oblique (side-facing) seats with airbag devices or 3-point restraints.

Discussion

The FAA has been conducting and sponsoring research on appropriate injury criteria for oblique (side-facing) seat installations. However, the FAA research program is not complete and the FAA may update these criteria as the FAA obtains further research results. To reflect current research findings, the FAA issued policy statement PS-ANM-25-03-R1, “Technical Criteria for Approving Side-Facing Seats,” November 12, 2012 to update injury criteria for fully side-facing seats, and policy statement PS-AIR-25-27, “Technical Criteria for Approving Oblique Seats,” July 11, 2018 to define injury criteria for oblique (side-facing) seats. Refer to these policy statements for definitions of variables used in the formulae shown in the conditions of this document.

The installation of these single occupant, oblique (side-facing) seats is novel given that the Airbus Model A330-300 certification basis does not adequately address protection of the occupant’s neck and spine for seat configurations that are positioned at an angle greater than 18 degrees from the airplane centerline.

The installation of passenger seats at angles of 18 to 45 degrees to the airplane centerline is unusual in transport category airplanes due to the seat and occupant interface with the surrounding furniture that introduces occupant alignment and loading concerns with or without the installation of a 3-point or airbag restraint system, or both. These special conditions are necessary to further address these potential injuries to the occupant's neck and spine that were not contemplated in 14 CFR 25.785.

The FAA-sponsored research mentioned earlier has found that an unrestrained flailing of the upper torso, even when the pelvis and torso are nearly aligned, can produce serious spinal and torso injuries. At lower impact severities, even with significant misalignment between the torso and pelvis, these injuries did not occur. Tests with an FAA H-III anthropomorphic test device (ATD) have identified a level of lumbar spinal tension corresponding to the no-injury impact severity. This level of tension is included as a limit in the special conditions. The spine tension limit selected is conservative with respect to other aviation injury criteria because it corresponds to a no-injury loading condition.

As noted in the special conditions for the airbag restraint system, because an airbag restraint system is essentially a single-use device, the airbag potentially could deploy under crash conditions that are not sufficiently so severe as to require head-injury protection from the airbag restraint system. Because an actual crash is frequently composed of a series of impacts before the airplane comes to rest, this could render the airbag restraint system useless if a larger impact follows the initial impact. This situation does not exist with energy-absorbing pads or upper-torso restraints, which tend to provide protection according to the severity of the impact. Therefore, the installation of the airbag

restraint system should be such that the airbag restraint system will provide protection when it is required, and will not expend its protection when it is not needed.

Because these airbag restraint systems may or may not activate during various crash conditions, the injury criteria listed in the special conditions and in § 25.562 must be met in an event that is slightly below the activation level of the airbag restraint system.

These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

Applicability

As discussed above, these special conditions are applicable to the Airbus Model A330-300 airplane as modified by VT DRB. Should VT DRB apply at a later date for a supplemental type certificate to modify any other model included on Type Certificate No. A46NM to incorporate the same novel or unusual design feature, these special conditions would apply to that model as well.

Conclusion

This action affects only a certain novel or unusual design feature on one model of airplane. It is not a rule of general applicability and affects only the applicant who applied to the FAA for approval of these features on the airplane.

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

Authority Citation

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40113, 44701, 44702, 44704.

The Special Conditions

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for Airbus Model A330-300 airplanes as modified by VT DRB.

In addition to the requirements of § 25.562, passenger seats installed at an angle between 18 degrees and 45 degrees from the airplane longitudinal centerline must meet the following:

Side-Facing Seats Special Conditions:

1. Head Injury Criteria:

Compliance with § 25.562(c)(5) is required, except that, if the ATD has no apparent contact with the seat/structure but has contact with an airbag, a head-injury criterion (HIC) unlimited score in excess of 1000 is acceptable, provided the HIC15 score (calculated in accordance with 49 CFR 571.208) for that contact is less than 700.

2. Body-to-Wall/Furnishing Contact:

If a seat is installed aft of structure (e.g., an interior wall or furnishing) that does not provide a homogenous contact surface for the expected range of occupants and yaw angles, then additional analysis and tests may be required to demonstrate that the injury criteria are met for the area that an occupant could contact. For example, if different yaw angles could result in different airbag performance, then additional analysis or separate tests may be necessary to evaluate performance.

3. Neck Injury Criteria:

The seating system must protect the occupant from experiencing serious neck injury. The assessment of neck injury must be conducted with the airbag device activated, unless there is reason to also consider that the neck-injury potential would be higher for impacts below the airbag-device deployment threshold.

- a. The N_{ij} (calculated in accordance with 49 CFR 571.208) must be below 1.0, where $N_{ij} = F_z/F_{zc} + M_y/M_{yc}$, and N_{ij} critical values are:
 - i. $F_{zc} = 1530$ lb for tension
 - ii. $F_{zc} = 1385$ lb for compression
 - iii. $M_{yc} = 229$ lb-ft in flexion
 - iv. $M_{yc} = 100$ lb-ft in extension
- b. In addition, peak F_z must be below 937 lb in tension and 899 lb in compression.
- c. Rotation of the head about its vertical axis, relative to the torso, is limited to 105 degrees in either direction from forward-facing.
- d. The neck must not impact any surface that would produce concentrated loading on the neck.

4. Spine and Torso Injury Criteria:

- a. The lumbar spine tension (F_z) cannot exceed 1200 lb.
- b. Significant concentrated loading on the occupant's spine, in the area between the pelvis and shoulders during impact, including rebound, is not acceptable. During this type of contact, the interval for any rearward (X direction) acceleration exceeding 20g must be less than 3 milliseconds

as measured by the thoracic instrumentation specified in 49 CFR part 572, subpart E, filtered in accordance with SAE International (SAE) recommended practice J211/1, “Instrumentation for Impact Test–Part 1–Electronic Instrumentation.”

- c. The occupant must not interact with the armrest or other seat components in any manner significantly different than would be expected for a forward-facing seat installation.

5. Pelvis Criteria:

Any part of the load-bearing portion of the bottom of the ATD pelvis must not translate beyond the edges of the seat bottom seat-cushion supporting structure.

6. Femur Criteria:

Axial rotation of the upper leg (about the z-axis of the femur per SAE Recommended Practice J211/1) must be limited to 35 degrees from the nominal seated position. Evaluation during rebound does not need to be considered.

7. ATD and Test Conditions:

Longitudinal tests conducted to measure the injury criteria above must be performed with the FAA Hybrid III ATD, as described in SAE 1999-01-1609, “A Lumbar Spine Modification to the Hybrid III ATD for Aircraft Seat Tests.” The tests must be conducted with an undeformed floor, at the most-critical yaw cases for injury, and with all lateral structural supports (e.g. armrests or walls) installed.

Note: The applicant must demonstrate that the installation of seats via plinths or pallets meets all applicable requirements. Compliance with the guidance contained in policy memorandum PS-ANM-100-2000-00123, “Guidance for

Demonstrating Compliance with Seat Dynamic Testing for Plinths and Pallets,”
dated February 2, 2000, is acceptable to the FAA.

Inflatable Airbag Restraint Systems Special Conditions:

If inflatable airbag restraint systems are installed, the airbag systems must meet the requirements of Airbus Model A330 special conditions no. 25-395-SC, “Seats with Inflatable Lapbelts.”

Issued in Des Moines, Washington, on December 6, 2019.

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